



Land at Rainbow Industrial Estate, West Drayton

Flood Risk Assessment

On behalf of **Troutbourne LLP**

Project Ref: 332410017 | Rev: A | Date: April 2021

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Document Control Sheet

Project Name: Land at Rainbow Industrial Estate

Project Ref: 332410017

Report Title: Flood Risk Assessment

Doc Ref: Revision A

Date: April 2021

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Revision	Date	Description	Prepared	Reviewed	Approved
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Executive Summary

This Flood Risk Assessment (FRA) has been prepared by Stantec to support a planning application for use of the site for sui generis storage uses for a temporary period of three years at Rainbow Industrial Estate, West Drayton in the London Borough of Hillingdon.

The planning application seeks a meanwhile use of the site pending a wider scheme for redevelopment of the Rainbow and Kirby industrial estate sites. The historic commercial use of the site and the temporary airport parking use have now ceased and is cleared off development excepting two portacabins which will be retained as part of the proposals.

In accordance with the fundamental objectives of the National Planning Policy Framework (NPPF) (2019), the FRA demonstrates that:

- i. The development is safe through appropriate management of flood risk;
- ii. The development does not increase flood risk; and,
- iii. The development does not detrimentally impact to other parties.

The online Flood Map for Planning indicates that the site is located within Flood Zone 1 'Low Probability' of flooding (as defined in Planning Practice Guidance (PPG) Table 1) as follows:

Flood Zone 1 - 'Low Probability' less than a 1 in 1000 (0.1%) Annual Probability of flooding from the rivers and sea.

The proposals for use of the land as temporary storage as classified as 'Less Vulnerable' uses as defined in PPG Table 2. According to PPG Table 3, the land use is appropriate for Flood Zone 1. A NPPF Sequential Test is not required as the site is located within Flood Zone 1 and 'Less Vulnerable' uses are considered appropriate for Flood Zone 1 without the need to apply the Exception Test.

Whilst the majority of the site is considered as being at a 'Very Low' susceptibility to surface water flooding, there are areas located within the site boundary which are considered as being at a 'Low' and 'Medium' susceptibility to surface water flooding. The site is considered as being at a moderate risk of groundwater flooding. The site is not located within a Critical Drainage Area (CDA) but is located immediately to the west of CDA Group 1_015.

The site is located adjacent to the Grand Union Canal and whilst in the event of bank overtopping or breach flood water may enter the site, the risk of canal breach is however considered to be low as the site sits at a higher level to the canal.

The site is also considered as being at a moderate risk of sewer flooding.

The proposals are made for sui generis use of the site including open and closed storage uses and other commercial uses for a temporary period and as such, a surface water drainage strategy has not been prepared for the site. The site is a former industrial estate which is served by a positive drainage system. The proposed use of the site will not increase the impermeable area of the site and therefore, surface water runoff is not considered to increase as a result. Due to the temporary nature of the proposals, it is not proportionate to develop and implement a surface water drainage strategy for the proposed use and on this basis, the site will continue to drain as existing.

In conclusion, the future occupants and users of the proposed development will be at a low risk of flooding. It is demonstrated that the proposal complies with the NPPF, NPPG and the local planning policy with respect to flood risk and is appropriate development at this location.

1 Introduction

1.1 Scope of Report

- 1.1.1 This Flood Risk Assessment has been prepared by Stantec UK Ltd on behalf of Troutbourne LLP to support a planning application on land at Rainbow Industrial Estate, West Drayton in the London Borough of Hillingdon (LBH).
- 1.1.2 The proposals follow a planning appeal against the refusal of planning permission by LB Hillingdon (LBH) on 6th December 2018 for '*Continued use of land for car parking (sui generis use) and retention of two portacabin units for 24 months*' under LPA Ref: 38058/APP/2018/3554 and subsequent enforcement notice appeal for the same development. The conjoined planning appeal and enforcement notice appeals (PINS Ref: APP/R5510/C/19/3221239 & APP/R5510/W/19/3230443) were withdrawn in June 2020.
- 1.1.3 An FRA (September 2018) was previously prepared by Stantec in relation to a 2018 application for the continuation of the airport parking use for a further 24 month period.
- 1.1.4 The airport parking use has now ceased, and an alternative temporary use of the site is now sought by the Applicant for,
- 'Retention of two portacabins and entrance gates onto Trout Road and use of site for sui generis uses including container storage; open and closed storage of building, scaffolding and aggregate materials; vehicle storage and sales; and other commercial uses'*
- 1.1.5 The proposed use is sought for a temporary period of three years as a meanwhile use of the site whilst a mixed use, residential-led scheme for the Rainbow and Kirby Industrial sites is discussed with the LPA.

1.2 Sources of Information

- 1.2.1 The FRA has been prepared based on the following sources of information:
- The **Environment Agency (EA) Online Flood Maps for Planning**^[1] and Long Term Flood Risk^[2] ;
 - London Borough of Hillingdon's **Preliminary Flood Risk Assessment (PFRA) Addendum**, dated 2017;
 - West London **Strategic Flood Risk Assessment (SFRA)**, dated 2018; and
 - London Borough of Hillingdon's **Surface Water Management Plan (SWMP)**.

1.3 Policy Context

- 1.3.1 This FRA has been prepared in accordance with the relevant national, regional and local planning policy and statutory authority guidance as follows:
- National policy contained within the **National Planning Policy Framework (NPPF)** dated February 2019, issued by Communities and Local Government, with reference to Section 14 'Meeting the challenge of climate change, flooding and coastal change';

¹ <https://flood-map-for-planning.service.gov.uk/>

² <https://flood-warning-information.service.gov.uk/long-term-flood-risk/>

- The NPPF **Planning Practice Guidance (PPG)** published in March 2019 ('Flood Risk and Coastal Change' section);
- **Flood Risk Assessments: Climate Change Allowances** released in February 2016, and updated in July 2020 updates previous climate change allowances to support the NPPF;
- **The London Plan** (Greater London Authority, March 2021) provides the spatial development strategy for Greater London. Relevant policies are listed below:

Policy SI12 Flood Risk Management

- a) *"Current and expected flood risk from all sources across London should be managed in a sustainable and cost-effective way in collaboration with the Environment Agency, the Lead Local Flood Authorities, developers and infrastructure providers.*
- b) *Development Plans should use the Mayor's Regional Flood Risk Appraisal and their Strategic Flood Risk Assessment as well as Local Flood Risk Management Strategies, where necessary, to identify areas where particular and cumulative flood risk issues exist and develop actions and policy approaches aimed at reducing these risks. Boroughs should co-operate and jointly address cross-boundary flood risk issues including with authorities outside London.*
- c) *Development proposals should ensure that flood risk is minimised and mitigated, and that residual risk is addressed. This should include, where possible, making space for water and aiming for development to be set back from the banks of watercourses.*
- d) *Developments Plans and development proposals should contribute to the delivery of the measures set out in Thames Estuary 2100 Plan. The Mayor will work with the Environment Agency and relevant local planning authorities, including authorities outside London, to safeguard an appropriate location for a new Thames Barrier.*
- e) *Development proposals for utility services should be designed to remain operational under flood conditions and buildings should be designed for quick recovery following a flood.*
- f) *Development proposals adjacent to flood defences will be required to protect the integrity of flood defences and allow access for future maintenance and upgrading. Unless exceptional circumstances are demonstrated for not doing so, development proposals should set be set back from flood defences to allow for any foreseeable future maintenance and upgrades in a sustainable and cost-effective way."*

Policy SI13 Sustainable Drainage

- a) *"Lead Local Flood Authorities should identify – through their Local Flood Risk Management Strategies and Surface Water Management Plans – areas where there are particular surface water management issues and aim to reduce these risks. Increases in surface water run-off outside these areas also need to be identified and addressed.*
- b) *Development proposals should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible. There should also be a preference for green over grey features, in line with the following drainage hierarchy:*
 - 1) *rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation)*

- 2) *rainwater infiltration to ground at or close to source*
 - 3) *rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)*
 - 4) *rainwater discharge direct to a watercourse (unless not appropriate)*
 - 5) *controlled rainwater discharge to a surface water sewer or drain*
 - 6) *controlled rainwater discharge to a combined sewer.*
- c) *Development proposals for impermeable surfacing should normally be resisted unless they can be shown to be unavoidable, including on small surfaces such as front gardens and driveways.*
- d) *Drainage should be designed and implemented in ways that promote multiple benefits including increased water use efficiency, improved water quality, and enhanced biodiversity, urban greening, amenity and recreation.”*
- Local planning policy contained within the London Borough of Hillingdon’s Local Plan Part 1 (adopted November 2012), with particular reference to Policy EM6 which states that:

“The Council will require new development to be directed away from Flood Zones 2 and 3 in accordance with the principles of the National Planning Policy Framework (NPPF).

The subsequent Hillingdon Local Plan: Part 2 – Site Specific Allocations LDD will be subjected to the Sequential Test in accordance with the NPPF. Sites will only be allocated within Flood Zones 2 and 3 where there are overriding issues that outweigh flood risk. In these instances, policy criteria will be set requiring future applicants of these sites to demonstrate that flood risk can be suitably mitigated.

The Council will require all development across the borough to use sustainable urban drainage systems (SuDS) unless demonstrated that it is not viable. The Council will encourage SuDS to be linked to water efficiency methods. The Council may require developer contributions to guarantee the long term maintenance and performance of SuDS is to an appropriate standard.”
 - The London Borough of Hillingdon’s Local Plan Part 2 (adopted January 2020). Relevant policies are listed below:

Policy DMEI 9

“Development proposals in Flood Zones 2 and 3a will be required to demonstrate that there are no suitable sites available in areas of lower flood risk. Where no appropriate sites are available, development should be located on the areas of lowest flood risk within the site. Flood defences should provide protection for the lifetime of the development. Finished floor levels should reflect the Environment Agency’s latest guidance on climate change.

Development proposals in these areas will be required to submit an appropriate level Flood Risk Assessment (FRA) to demonstrate that the development is resilient to all sources of flooding.”

Policy DMEI 10

“Applications for all new build developments (not conversions, change of use, or refurbishment) are required to include a drainage assessment demonstrating that

appropriate sustainable drainage systems (SuDS) have been incorporated in accordance with the London Plan Hierarchy (Policy 5.13: Sustainable drainage)."

1.4 Caveats/Exclusions

- 1.4.1 This FRA has been prepared in accordance with the NPPF, regional and local planning policy. Any recommendations regarding floor levels are based on the relevant British Standards (BS 8533), the standing advice provided by the EA or based on common practice.
- 1.4.2 The Construction (Design and Management) Regulations 2015 (CDM Regulations) will apply to any future development of this site which involves "construction" work, as defined by the CDM Regulations. As such it is the responsibility of the proposed developer (ultimate client) to fulfil its duties under the CDM Regulations.
- 1.4.3 The approach for the FRA and proposals for the surface water management strategy are based on the requirements of the EA and Hillingdon London Borough Council in its role as Lead Local Flood Authority (LLFA).
- 1.4.4 The findings of this FRA are based on data available at the time of the study and on the subsequent assessment that has been undertaken in relation to the development proposals.
- 1.4.5 It should be noted that the insurance market applies its own tests to properties in terms of determining premiums and the insurability of properties for flood risk. Those undertaking development in areas which may be at risk of flooding are advised to contact their insurers or the Association of British Insurers (ABI) to seek further guidance prior to commencing development.
- 1.4.6 Stantec does not warrant that the advice in this report will guarantee the availability of flood insurance either now or in the future.

1.5 Flood Risk Assessment credentials

- 1.5.1 Stantec has many years of experience in, amongst other areas, the assessment of flood risk, hydrology, flood defence and river engineering. The authors and reviewers of the document are experienced engineers, and the reviewers are members of chartered institutions such as the Chartered Institution of Water and Environmental Management (CIWEM) or the Institution of Civil Engineers (ICE).
- 1.5.2 A FRA (September 2018) was previously prepared by Stantec in relation to a 2018 application for the continuation of the airport parking use for a further 24 month period on this site.
- 1.5.3

2 Proposed Development Site

2.1 Site Description

- 2.1.1 The site is located at grid reference (NGR) 505866 (E) 180493 (N) and covers an area of approximately 1.25 hectares (ha).
- 2.1.2 The site is bound by Trout Road to the north, an industrial area to the east known as Kirby Industrial Estate and the rear gardens of residential properties and the Al Falah Islamic Centre to St Stephen's Road to the south and the Grand Union Canal to the west.
- 2.1.3 The site is cleared off development and was formerly an industrial site comprising a range of single storey and two storey industrial and commercial buildings. The site comprises off unmade ground with the exception of a small area of hardstanding by the Trout Road entrance.
- 2.1.4 The site was previously used for airport parking pending redevelopment of the wider Rainbow and Kirby Industrial Estates Site. Whilst the airport parking use has now ceased two portacabins, the Trout Road entrance gates, an area of hardstanding and CCTV and lighting associated with this use remains in situ and will be retained as part of the current proposals.
- 2.1.5 A site located plan is presented in **Figure 2.1**.

Figure 2.1 Site Location Plan



Not to Scale

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2.2 Topography

- 2.2.1 Topographical levels for the site were obtained from the 'Foul Sewerage and Utilities Assessment' prepared by Ramboll (report reference 19890/3, Attached in **Appendix A**) which states that current ground levels on the site vary between 48.11 mAOD at the southern side of the site and 49.90 mAOD at High Street.
- 2.2.2 The water level in the canal at the time of survey was 49.29mAOD with a top of bank level of 49.51mAOD.

2.3 Hydrological Setting

- 2.3.1 A review of Ordnance Survey (OS) mapping indicates that the Grand Union Canal is located adjacent to the southern boundary of the site.
- 2.3.2 Fray's River is located immediately to the west of the Grand Union Canal approximately 150m west of the site and flows in a southwards direction. Fray's River is an Environment Agency (EA) defined 'Main River'.
- 2.3.3 The River Pinn is located approximately 300m north of the site and flows in an eastwards direction before discharging into Fray's River approximately 200m northwest of the site. The River Pinn is an EA defined 'Main River'.

2.4 Geology and Hydrogeology

- 2.4.1 A review of the 1:50,000 scale British Geological Survey (BGS) online digital viewer indicates that the site is underlain by a bedrock geology of the 'London Clay Formation' comprising clay, silt and sand. The bedrock geology is classified as an unproductive stratum by the EA.
- 2.4.2 The online BGS 1:50,000 scale superficial geology map indicates that the site is underlain by the 'Langley Silt Member' comprising clay and silt. The superficial geology is classified as an unproductive stratum by the EA.
- 2.4.3 The National Soil Resources Institute (NSRI) Soilscape viewer indicates that the site is situated on 'loamy and clayey floodplain soils with naturally high groundwater'.
- 2.4.4 The site is not located within an EA Groundwater Source Protection Zone (SPZ).

2.5 Existing Drainage

On Site Drainage

- 2.5.1 Information contained within the 'Foul Sewerage and Utilities Assessment' prepared by Ramboll (report reference 19890/3) indicates that there are some existing roofs and hardstanding areas to the south of the site which drain to a pumping station. The pumping station discharges flows into the canal.
- 2.5.2 It is however, unknown how the remainder of surface water from the site is disposed of.

Public Sewer Network

- 2.5.3 Information contained within the 'Foul Sewerage and Utilities Assessment' prepared by Ramboll (report reference 19890/3) indicates that there is a surface water sewer located to the south of the site.
- 2.5.4 There is also a 225mm diameter foul sewer which crosses the site at a depth of 1.5m to 2m.

2.6 Existing Flood Defences

2.6.1 The site is located within Flood Zone 1 and is not considered to benefit from flood defences.

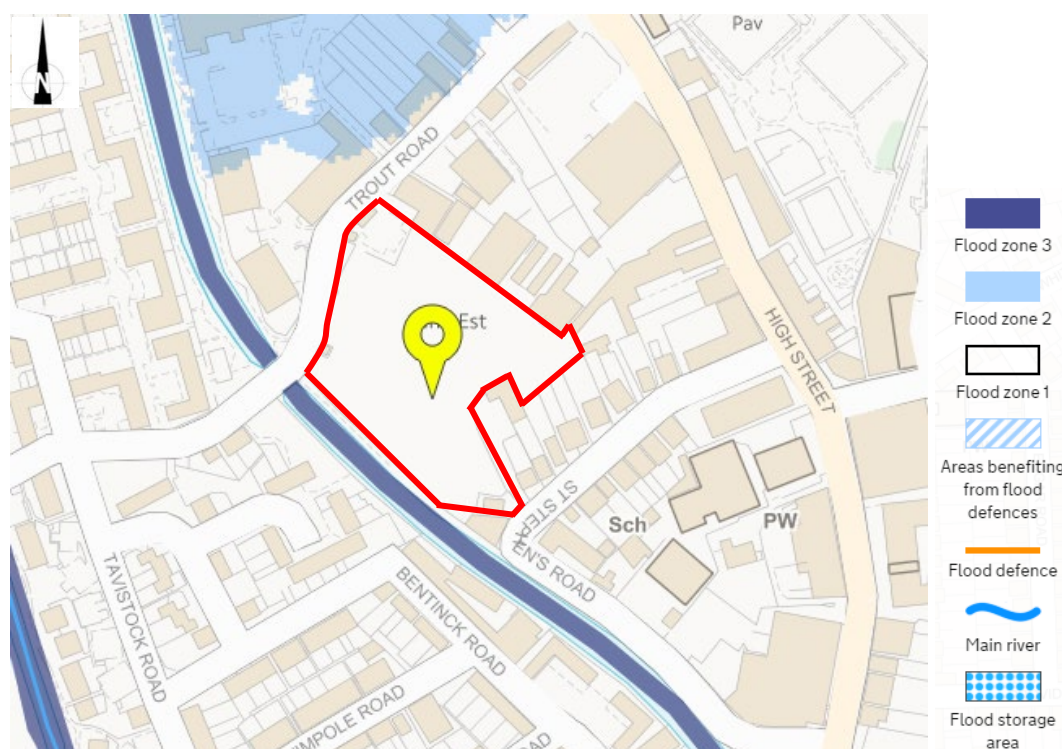
3 Assessment of Flood Risk

3.1 Fluvial and Tidal Flooding

3.1.1 The first phase in identifying whether a site is potentially at risk of flooding is to consult the online 'Flood Map for Planning' hosted on the GOV.UK website. This website presents Flood Zones, which are the starting point for assessing the probability of flooding from rivers and/or the sea. They are also used as the basis for determining which development types are appropriate within a given location and whether the Sequential Test or Exception Test need to be applied.

3.1.2 An extract of the online Flood Map for Planning is presented in **Figure 3.1**.

Figure 3.1 Extract of the online Flood Map for Planning



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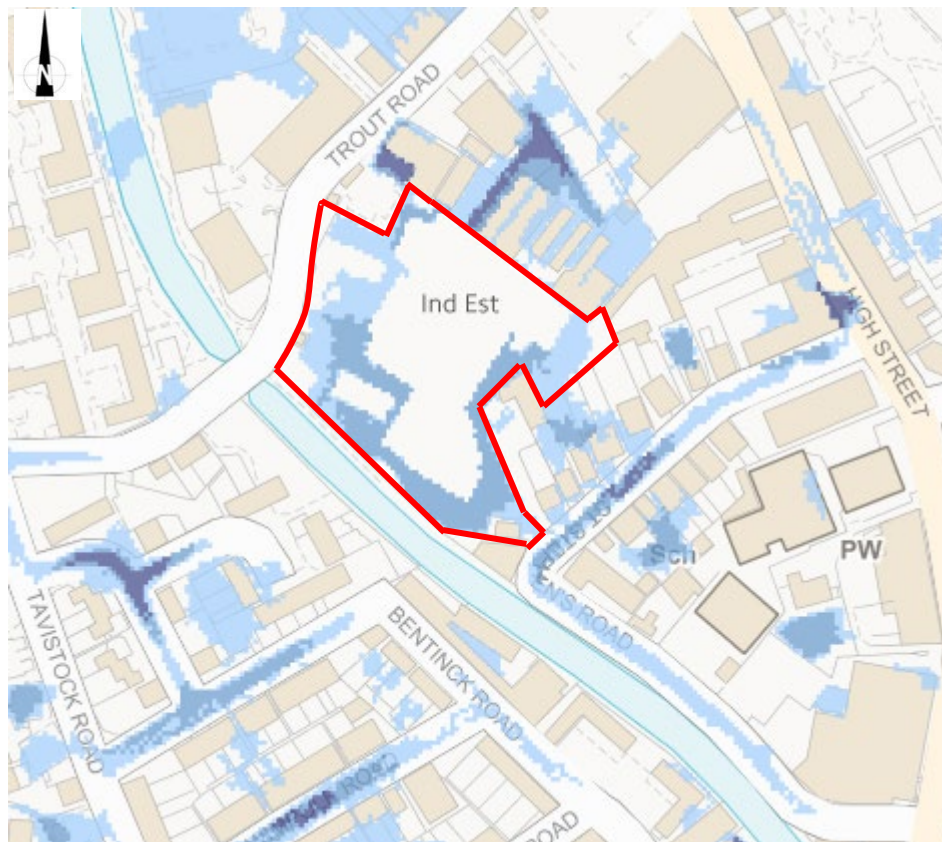
3.1.3 The online Flood Map for Planning indicates that the site is located entirely within **Flood Zone 1 'Low Probability' less than a 1 in 1000 (0.1%) Annual Exceedance Probability (AEP) of river or sea flooding.**

3.1.4 The risk of fluvial or tidal flooding is therefore considered to be low.

3.2 Surface Water Flooding

3.2.1 The online Risk of Flooding from Surface Water map shows where areas could be potentially susceptible to surface water flooding in an extreme rainfall event. An extract of the online Risk of Flooding from Surface Water map is presented in **Figure 3.2**.

Figure 3.2 Extract of the online Risk of Flooding from Surface Water map



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- 3.2.2 The online Risk of Flooding from Surface Water map indicates that a large portion of the site is considered as being at a 'Very Low' risk to surface water flooding. This is defined as having less than a 1 in 1000 (0.1%) AEP of flooding in any one year.
- 3.2.3 The EA mapping indicates that there are areas located within the northeast and southeast corner, as well as a flow path running parallel to the western boundary of the site which are considered to be at 'Low' risk of surface water flooding. This is defined as having between a 1 in 1000 and 1 in 100 (0.1%-1%) AEP of flooding. A review of the online map indicates that flood depths could vary from 300mm to 900mm and the flood velocities are predominantly lower than 0.25m/s.
- 3.2.4 The EA mapping indicates that there are several areas located in close proximity to the permitter of the scheme's northeastern to western boundary of the site, shown to be at 'Medium': defined as having between a 1 in 100 and 1 in 30 (1%-3.3%) AEP to 'Low' risk of surface water flooding. A review of the online maps indicates that flood depths in this area are predominantly less than 300mm and the velocities are less than 0.25m/s.
- 3.2.5 It should be noted that these maps are generated using a relatively coarse methodology whereby rainfall inflows are routed over a ground surface model. The analysis assumes a suitable 'typical' approach to represent the effects of urban drainage infrastructure and highlights low lying areas of topography and preferential flow paths that may be more susceptible to surface water flooding in the event of extreme rainfall.

- 3.2.6 The PFRA indicates that there are no recorded incidents of surface water flooding in the vicinity of the site.
- 3.2.7 The SWMP indicates that the site is not located within a Critical Drainage Area (CDA) but is located immediately to the west of CDA Group 1_015.
- 3.2.8 The overall risk of surface water flooding is considered to be low to moderate.

3.3 Reservoir Flooding

- 3.3.1 The online Risk of Flooding from Reservoirs Map indicates that the site is not located within an area considered as being at risk in the event of reservoir breach.
- 3.3.2 It should be emphasised that the risk of flooding from reservoir breach is very small in any case; the EA is the enforcement authority for the Reservoir Act (1975) and all large raised reservoirs are inspected and supervised by reservoir panel engineers.

3.4 Groundwater Flooding

- 3.4.1 The PFRA indicates that the site is not located within an area which is considered as having increased potential for groundwater flooding.
- 3.4.2 The West London SFRA indicates that the site is located within an area with $\geq 50\%$ to $< 75\%$ susceptibility to groundwater flooding.
- 3.4.3 The NSRI Soilscape viewer indicates that the site is situated on 'loamy and clayey floodplain soils with naturally high groundwater'.
- 3.4.4 The risk of groundwater flooding is therefore considered to be moderate.

3.5 Sewer Flooding

- 3.5.1 The PFRA indicates that there are 16-25 recorded incidents of sewer flooding in the UB7 7 post code area in the period December 2011 to June 2017.
- 3.5.2 The West London SFRA shows there to be no sewer flooding records in the area according to the Thames Water 2017 dataset.
- 3.5.3 The SFRA / PFRA does not detail if there were any sewer flooding recorded within the site or at close proximity. The proposed development will continue to discharge, as per the existing scenario and therefore there will be no increased impact on the local sewer network. Therefore, the risk of sewer flooding is considered to be low.

3.6 Canals, Ponds or other Artificial Watercourses

- 3.6.1 The Grand Union Canal is located adjacent to the southern boundary of the site. The canal is maintained by the Canal and River Trust and forms a branch of the organisation's longest canal linking London to Birmingham^[3] (C&RT, 2021). The PFRA, SFRA and SWMP did not contain any information relating to the risk of breach from the canal.
- 3.6.2 A review of ground levels indicates that the tow path is higher than the site and that in the unlikely event of flooding or canal breach that flood water may enter the site.

³ [Grand Union Canal | Walks near me | Canal & River Trust](#)

- 3.6.3 Regular inspections are undertaken to minimise the risk of breach failure as a result of flooding, vandalism or structural failure.
- 3.6.4 The risk of flooding from canals is however, considered to be low.
- 3.6.5 There are no other canals, ponds or other artificial watercourses located within the vicinity of the site.

3.7 Summary of Flood Risk

- 3.7.1 From a review of the information above, it can be concluded that the site is considered as being at low to moderate risk from surface water, groundwater and sewer flooding and at residual risk in the event of canal bank overtopping or breach.

3.8 Impact of Climate Change

- 3.8.1 In considering flood risk to the site, it is necessary to fully consider the potential impacts of climate change for the lifetime of the development within the mitigation measures.
- 3.8.2 The EA released new guidance of the application of climate change allowances in flood risk assessments⁴. This guidance provides contingency allowances for potential increases in peak river flow in Table 1, and potential increases in rainfall intensity in Table 2.
- 3.8.3 The peak river flow allowances table provides a range of allowances based on percentile (i.e. the degree of certainty of an event occurring, based on the range of climate change scenarios assessed through scientific investigations). The provided allowances are also subject to the vulnerability classified of the proposed use and the river basin district of the site.
- 3.8.4 The conditions at the site and consequent peak river flow allowances to be considered as part of the FRA are as detailed in **Table 4.1**.

River Basin District	Flood Zone	Flood Risk Vulnerability Classification	Range of Climate Change Allowances requiring consideration (2070–2115)
			Central
<i>Thames</i>	<i>1</i>	<i>Less Vulnerable</i>	+25%

Table 4.1 Climate Change – Peak River Flow Allowances

- 3.8.5 Whilst OS mapping indicates that the Grand Union Canal is located adjacent to the western boundary of the site and Fray's River is located approximately 150m west of the site, as the site is for temporary uses with an expected lifetime of three years, it is not considered that climate change will impact on the site and has not been considered further as part of this assessment.

⁴ <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

4 Proposed Development and Sequential Test

4.1 Development Proposals

- 4.1.1 This FRA accompanies a planning application submitted for:

'Retention of two portacabins and entrance gates onto Trout Road and use of site for sui generis uses including container storage; open and closed storage of building, scaffolding and aggregate materials; vehicle storage and sales; and other commercial uses for a temporary period of 3 years'

- 4.1.2 The proposed use is sought for a temporary period of three years as a meanwhile use of the site whilst a mixed use, residential-led scheme for the Rainbow and Kirby Industrial sites is discussed with the LPA.

4.2 Flood Risk Vulnerability

- 4.2.1 The NPPF follows a risk based approach in determining the suitability of land for development in flood risk areas, with the intention of steering all new development to the lowest flood risk areas.
- 4.2.2 According to the online Flood Map for Planning, the site is located within Flood Zone 1 (defined as having a 'Low' probability of flooding from the rivers and sea).
- 4.2.3 PPG Table 2 confirms the 'Flood Risk Vulnerability Classification' of a site, depending on the proposed usage. The classification is subsequently applied to PPG Table 3 to determine:
- Whether the proposed development is suitable for the Flood Zone in which it is located; and,
 - Whether an Exception Test is required for the proposed development.
- 4.2.4 For the purposes of this assessment, the proposed use as a temporary storage facility falls within the 'Less Vulnerable' classification. A NPPF Sequential is not required as the site is located within Flood Zone 1 (defined as a 'Low' probability of flooding) and is therefore sequentially preferable. According to PPG Table 3, 'Less Vulnerable' uses are considered appropriate for Flood Zone 1 without the need to apply the Exception Test.

4.3 Sequential Approach

- 4.3.1 The NPPF encourages the application of the 'sequential approach' in the master-planning process for new developments, i.e. locating the more sensitive/vulnerable elements of new development in the areas which lie at lowest probability of flooding and, conversely, reserve the areas of the site at greatest risk of flooding for the least vulnerable elements of the development (or, preferably, leave such areas undeveloped or as soft landscaping).
- 4.3.2 In line with these principles, it is recommended that any temporary development is located outside the areas at risk of surface water flooding, where feasible. Where this is not possible, safe access and egress routes should be located outside of these areas at risk (or in areas where the flood depth is less than 300mm).

4.4 Surface Water Management

- 4.4.1 The site is vacant and is cleared off development excepting two portacabins which will be retained as part of the proposals. The impermeable area of the site has been reduced as a

result of the demolition and clearance of historic commercial use buildings. The proposed use as a temporary storage facility for three years will not increase the overall impermeable area of the site and on this basis, it is considered the surface water runoff will not increase as a result of the temporary permission.

- 4.4.2 As the site was formerly an industrial site, the site is served by a positive drainage system and as such, any surface water runoff generated by the site during its use as a temporary storage facility can be positively drained.
- 4.4.3 Whilst the site will comprise greater than 1000m² of commercial space in the form of a temporary storage facility, the site is for temporary use as a storage facility and as such, the implementation of SuDS strategy is not considered proportionate to the development.

5 Conclusion

5.1.1 This Flood Risk Assessment has been prepared by Stantec to support a planning application on land at Rainbow Industrial Estate, West Drayton, LBH and concludes that:

- The online Flood Map for Planning indicates that the site is located within Flood Zone 1 'Low Probability' (as defined in PPG Table 1) as follows:

Flood Zone 1 - 'Low Probability' less than a 1 in 1000 (0.1%) Annual Probability of flooding from the rivers and sea.

- The proposals for use of the land for temporary sui generis open and closed storage and other commercial uses is classified as a 'Less Vulnerable' use as defined in PPG Table 2. According to PPG Table 3, the land use is appropriate for Flood Zone 1. A NPPF Sequential Test is not required as the site is located within Flood Zone 1 and 'Less Vulnerable' uses are considered appropriate for Flood Zone 1 without the need to apply the Exception Test.
- Whilst the majority of the site is considered as being at a 'Very Low' susceptibility to surface water flooding, there are areas located within the site boundary which are considered as being at a 'Low' and 'Medium' risk to surface water flooding. The site is considered as being at a moderate risk of groundwater flooding. The site is not located within a Critical Drainage Area (CDA) but is located immediately to the west of CDA Group 1_015.
- The site is located adjacent to the Grand Union Canal and whilst in the event of bank overtopping or breach flood water may enter the site, the risk of canal breach is considered to be low particularly as the site is located at a high level than the canal.
- The site is also considered as being at a low risk of sewer flooding.
- Temporary development should be located outside the areas risk of surface water flooding, where feasible. Where this is not possible, safe access and egress routes should be provided outside of these areas at risk (or in areas where the flood depth is less than 300mm).
- Development proposals are for use of the site as a temporary storage facility and as such, a surface water management strategy has not been prepared for the site. The site is a former industrial estate which is served by a positive drainage system. The use of the site as temporary storage facility will not increase the impermeable area of the site and therefore, surface water runoff is not considered to increase as a result. Due to the temporary nature of the proposals, it is not proportionate to develop and implement a surface water drainage strategy. On this basis, it is proposed that the site will continue to drain as existing.

5.1.2 In conclusion, the future occupants and users of the proposed development will be at a low risk of flooding. It is demonstrated that the proposal complies with the NPPF, NPPG and the local planning policy with respect to flood risk and is appropriate development at this location.

Appendix A

Ramboll Foul Sewerage and Utilities Assessment 2012



RAINBOW ESTATE, WEST DRAYTON

Foul Sewerage and Utilities Assessment

for

Bourne End Investments Ltd

project no. 19890/3

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5	PROPOSED STRATEGY	14

Revision History

Rev	Date	Purpose/Status	Document Ref.	Comments

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Electronic signature

Reviewed by:

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1 INTRODUCTION

1.1 Objective

This report will confirm that the current site (and in the direct vicinity) there are a range of statutory undertaker apparatus, including surface, foul, electrical, gas and mains water.

The objective of this document is to set out a strategic strategy for the foul water, surface water and other services. It shall confirm that, with the available evidence, we are not aware of any services related restrictions which would prevent the redevelopment of the site.

The proposal is to provide 99 residential units (C3), 50 extra care sheltered housing scheme, 17 business units (B1) (1,529.4 m2) and 437.00 m2 of restaurant/cafe (A3) floor-space.

The report will show how the surface water measures proposed consider the water cycle and that they introduces water to the built environment, in accordance with the recent HM Government White Paper "Water for Life".

1.2 Report Structure

Section 2 of this report details the site location and summarises the available survey and desk study information associated with the proposed drainage strategy. Section 3 presents the relevant national, regional and local legislation to which the drainage strategy is required to comply. Options for the collection, conveyance, attenuation and disposal of surface water are detailed in Section 4. Section 5 describes the proposed strategy.

1.3 Constraints and Limitations

This report has been prepared for exclusive use by Bourne End Investments Ltd (BEI) to support the associated site planning application.

The information contained in this report is based on a review of existing information and consultation with interested parties. No other warranty whether express or implied is made to third parties in respect of the information presented within this report. Any liability arising out of the use by BEI or any third party of this report for purposes not wholly connected with the above shall be the responsibility of BEI and such third party who shall indemnify Ramboll UK against all claims, costs, damages and losses arising out of such use.

Ramboll UK has endeavoured to assess all information provided to them during this appraisal. The report summarises information from a number of external sources and cannot offer any guarantees or warranties for the completeness or accuracy of information relied upon. Ramboll UK has not verified information from third parties unless otherwise stated in this report.

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2 SITE INFORMATION

2.1 Records Review

The key reports and websites reviewed as part of this study are listed in Table 2.1 below.

Table 2.1 – Key Reports or documents

Title	Author	Document Date
Ground Investigation	Soiltechnics	9/10/2010
Topographical survey	Seasman Smith	-
FRA V2.0	JBA Consulting	4/2012
The Town and Country Planning (Environmental Impact Assessment) Regulations 2011 Request for Screening Opinion	LB Hillingdon	19 October 2011

2.2 Consultations

A number of agencies and individuals have been contacted and/or their records reviewed during development of the drainage philosophy. A summary of the conversations and/or information supplied is provided in Table 2.2.

Table 2.2 – List of Consultees

Consultee	Description of Information Reviewed
Environment Agency	N/A
Sewerage Undertaker	Water Industry Act (as amended) and Flood Water Management Act, Interim Guidance
Local Authority	LB Hillingdon
British Waterways	Nick Pogson BSc (Hons) MRICS Senior Utilities Surveyor Tel. 01636 675 719 Mob. 07825 357 355 Nick.Pogson@britishwaterways.co.uk Lesley Inwards Water Sales Account Manager Utilities Team 64 Clarendon Road Watford, Herts WD17 1DA Tel: 01923-201364 Mobile: 07801-049844
Highways Authority	N/A
SUDS Adoption body	None nominated to date

2.3 Location and Setting

Site Name	Rainbow Estate, Yiewsley
Purpose of development	Commercial and Residential Units
Existing land use	Industrial Units
OS	NGR TQ 058 807
Country	England
County	Greater London
Local Planning Authority	London Borough of Hillingdon

Table 2.3 – Existing Site Areas

Description	Area (m2)
Buildings	15000
External hardstandings	5812
Roads	600
Soft landscape	50

The total area to be re-developed is 2.14 hectares (ha).

2.4 Site Elevations

Current ground levels on the site vary between 48.11 at the southern side of the site and 49.9 to the high street. All levels are quoted AOD.

The water level in the canal at the time of the survey was 49.28. With a top of bank level of 49.51.

2.5 Geology

Made Ground was encountered at depths of 1.9m below surface levels. The Made Ground comprises a mixture of cohesive and granular soils containing gravels and cobbles of anthropogenic materials. Langley Silt was present in some areas to depths of up to 2.1m below surface levels and comprised low to medium strength brown silty clay. In some areas the Langley Silt was absent. The Lynch Hill Gravel was present across the site at depths of between 0.65m and 3.3m below surface levels and comprised a medium dense becoming dense sand and gravel with gravel comprising flint. The Lynch Hill Gravel is classified as a "Principle Aquifer" by the Environment Agency. London Clay deposits were present to depths beyond the limit of our investigations and comprised high to very high strength dark grey clay.

Geological summary

Strata	Bedrock or drift	Approximate thickness	Typical soil type	Likely permeability	Likely aquifer designation
Langley Silt Member	Drift	Unknown	Silty clay	Low	Unproductive strata
Lynch Hill Gravel	Drift	Unknown	Sand and gravel	High	Principle aquifer
London Clay	Bedrock	35m	Clay	Low	Unproductive strata

Table 3.5.1

Summary from Soiltechnics report.

2.6 Surface Waters

There is a public surface water sewer to the south of the site.

The Grand Union Canal is located to the south of the site.

The following has been discussed with British Waterways:

Does a license for the site exist?

There is a surface water licence on BW's real estate system for this location which has been terminated. Unfortunately we are having difficulty locating the file, However I can advise that our system shows this permitted 2no. 150mm surface water discharges.

Under what circumstance would a new licence be required?

Any discharge to BW's property would require a discharge licence.

Any increase in total flow per day/year?

Any application would need to be reviewed by our hydrologists on a risk basis. It may identify that mitigation works are required to the navigation to offset your proposed discharge for which BW would expect you to cover the cost.

Any increase in peak flow?
As above

How much variation do you get in the canal level in the vicinity of this site?
I will refer this matter to the local water engineer for comment.
[no response received. They are however controlled waters with limited variance]

What would charge be if applicable?
BW are not a drainage authority and do not have to accept discharges to its property. Each site will be assessed on its individual merits and any discharge licence would involve both a premium and annual fee. Generally the annual fee is based on the peak quantity of water you are discharging to the navigation.

Assuming a new licence is applied for, in relation to the pumped disposal of surface water, including limitation of limitation of peak flow to now more than 5 l/s/ha (11l/s) and with a net increase in water quality by the provision of surface based SUDS mechanisms, are BW aware of any operational reasons for refusal?
BW Policy is to support the use of professionally designed SUDS systems. BW are not aware of any local operational reasons why a licence to continue discharge would not be granted at this site.

2.7 Groundwater

Given the low level of the site relative to surrounding ground and the water level of the adjacent canal, there is a medium risk of ground water restricting the performance of deep groundwater discharge mechanisms – such as concrete ring soakaways.

It is expected that shallow, surface based – source control systems of infiltration and stormwater storage however will be viable.

In due course, shallow permeability testing will be undertaken across the site to confirm groundwater levels and enable detailed design of the system, along with further groundwater quality tests.

2.8 Hydrogeology

The site is not located within a zone protecting a potable water supply abstracting from a major aquifer (i.e. a source protection zone). The ground however has elements of potential contamination. A comprehensive contamination mitigation report will be written to ensure that the SUDS solutions do not present any increased hydrological risk.

The results of this further study will be reviewed in relation to the site waste management plan, contamination mitigation measures and any other relevant factors.

Should such investigation result in unavoidable issues in relation to water quality or groundwater then any porous asphalt or permeable car park area can be sealed at the formation, with minor amendment to the detailed design to reflect the reduced infiltration. Alternatively, where there are open grassed areas any existing ground will be removed and replaced with clean fill in accordance with best practice.

2.9 Site Walkover

This is already covered adequately in the geotechnical and FRA report.



2.10 FRA

A Flood Risk Assessment is available for the development. It the main flood risks identified related to site and local area surface water flooding during extreme events, or during surface water drainage infrastructure failure.

Surface based SUDS is recommended to improve water quality discharge and reduce the risk of flooding from that pre-development.

Careful attention in the design will be given to building levels and flood flow routes.

This will include identification of areas which could receive flood water during extreme events – such as landscaping or car parking areas, thereby minimising the risk of damage to buildings, utility apparatus and maintaining safe access routes.

2.11 Existing Site Foul Water Drainage

Based on existing records and discussions there are both private and public sewers within the site. A full CCTV survey will be undertaken in due course to confirm exact location and condition.

There is a 225mm foul sewer which crosses the site at a depth between 2 and 1.5m.

The sewer plans indicate another sewer connecting to the Trout Road further North.

2.12 Existing Site Surface Water Drainage

The site records indicate that some of the existing roofs and hardstanding areas to the south of the site drain to a pumping station. This pumping station discharges flows into the canal. No flooding on site has been reported and it is therefore understood to be operational.

This pumping station will be inspected and condition assessed for reuse against the new brief. If necessary, it would be possible to construct a new buried surface water pumping station at an appropriate alternative location, discharging to the same outlets.

A full CCTV survey of the site surface water drainage infrastructure will be undertaken in due course.

It is unknown where the surface and roof water for the remainder of the site discharges. Individual rain water pipes may discharge to small soakaways under the concrete hardstanding areas. Alternatively they may connect to the foul drains as a combined system.

Concrete hardstanding areas drain to a series of surface channels, linear drains and highway gullies.

Given the sites use in relation to vehicles, there is some potential that buried petrol or oil interceptors exist under concrete hardstanding areas. This will be investigated further in due course.

In the locality, the public surface water sewers appear to discharge into either the Grand Union Canal, or the Frays River to the South. The undertaker's mapping is not clear in this respect.

No surface water sewers are shown in Trout Road. There are highway gullies, so potentially there is also a highway drain. If so it would appear to have limited access. Alternatively it may be possible that this highway drains connect to the foul sewer.

To the North of the site in the High Street there is a surface water drain. This would appear to terminate near the site entrance. The depth of this would need checking but will be less than 700mm in relation to the surface. It may be possible for this to serve the proposed building directly next to the high street, but no others by gravity.

To the East of the site there is a surface water sewer in St Stephen's Road.

The records are not clear as to where this surface water sewer goes. One section goes to the North, to a pumping station on Yew Avenue.

Another section of 375mm surface water sewer is shown as going under the Canal, possibly laid under Padcroft Road to connect with the Fray's River. This would be a most unusual arrangement given the depth of the canal. It may be that the records are incorrect and discharge takes place into the canal rather than under it.

3 LEGISLATION

Table 3.1 below details the key legislation for which will or may reasonably at the date of this publication be considered to affect the drainage design.

Table 3.1 – Summary of Foul and Surface Water Drainage Legislation

Primary effect	Commentary	Implication on Drainage Philosophy
Water Industry Act 1991	Sets out drainage rights and agreements	Will provide primary mechanism for installation and adoption of foul drainage.
Water Resources Act 1991	Means on action for watercourse or groundwater pollution.	Requirement to avoid pollution.
Water Industry (Schemes for Adoption of Private Sewers) Regulations 2011	Amends WIA and sets out mechanism for National standards for foul sewers. Mandatory standards and adoption.	Considerable impact on costs, programme, agreement and layout. Covered in more detail within the report. DEFRA have delayed implementation to known date.
Land Drainage Act 1991	Rights and responsibilities in relation to land drainage of site and from other in vicinity	Necessity to consider wider flood risk outside boundary of site, will have especial impact on drainage in vicinity of boundary.
Building Regulations	Part H. Under amendment. For use in relation to foul drainage not covered by WI SfAPS	Minimum standards. Requirements regarding diversion of existing sewers etc.
Flood and Water Management Act 2010	Primary legislation provides provision for WI SfAPS and DSD AA.	This relates to the mechanism and adoption arrangements.
Draft Sustainable Drainage (Approvals and Adoptions) Regulations and Order 2012	Requirement for SUDS adoption and adoptable standards.	Not yet implemented. Approval of the SUDS acceptance authority will be obtained during the design process.
Secondary effect		
Water Framework Directive	Aim to reduce watercourse and groundwater pollution	Consideration as to basis of proposals.

2000/60/EU			
Climate Change Act 2008	The Act aims to enable the UK to become a low carbon economy and gives ministers powers to introduce the measures necessary to achieve a range of greenhouse gas reduction targets	Consideration as to climate change in design.	
Groundwater Directive 2006/118/EU	Aim to reduce groundwater pollution	Consideration as to basis of proposals.	
New Roads and Street Works Act 1991	Sets out requirements for works in streets.	Consideration as to basis of proposals.	
Highways Act 1980	Sets out requirements for works in streets.	Consideration as to basis of proposals.	
Water Bill (HL) 2003	Enabling act for various WIA changes.	Consideration as to basis of proposals.	

4 SURFACE WATER DRAINAGE OPTIONS

The use of sustainable urban drainage systems (SUDS) is mandatory for most new surface water drainage systems within the UK. SUDS can be used as source control (interception of surface water), conveyance, storage and discharge dependent on various site conditions. Table 5.1 below describes many of the SUDS approaches that are available and explains their advantages, disadvantages and appropriateness for use on the proposed development site.

Table 4.1 – Sustainable Urban Drainage System (SUDS) Options

SUDS group	Technique	Image	Description	Advantages	Disadvantages	Suitable for use at site
Retention	Balancing pond		Provides both storm water attenuation and treatment. Runoff from each rain event is detained and treated in the pool. The retention time promotes pollutant removal through sedimentation.	Good removal of pollutants, can be used where groundwater is vulnerable, good community acceptability, high ecological, and amenity benefits.	No reduction in runoff volume, land take may limit use in high density sites.	No. Suitable land not identified at this stage.
	Subsurface storage		Oversized pipes, tank systems and modular geocellular systems that can be used to create a below ground storage structure.	Modular and flexible, dual usage (infiltration/storage), high void ratios, can be installed beneath trafficked and soft landscaped areas.	No water quality treatment.	Yes, likely to be required
Wetland	Shallow wetland		Wetlands provide stormwater attenuation and treatment. They comprise shallow ponds and marshy areas, covered in aquatic vegetation. Wetlands detain flows for an extended period to allow sediments to settle and to remove contaminants. They can provide significant ecological benefits.	Good pollutant removal and if lined can be used where groundwater is vulnerable. Good community acceptability, ecological and amenity benefits.	Land take is high, requires baseflow, little reduction in runoff volume, not suitable for steep sites.	Not considered viable at this site.
	Extended detention wetland					
	Pond wetland					
	Pocket wetland					
	Submerged gravel wetland					
Infiltration	Wetland channel		Surface water runoff can be discharged directly to ground for	Reduces the volume of runoff, effective	Requires appropriate pre-	Yes, may be applied where
	Infiltration trench					
	Infiltration basin					

	Soakaway		infiltration by soakaways, basins, or trenches. A prerequisite is that both groundwater and ground conditions are appropriate to receive the quality and quantity of water generated.	at pollutant removal, contributes to groundwater recharge, simple and cost-effective, easy performance observation.	treatment, basins require a large flat area, offset from foundations.	reasonable.
Filtration	Surface sand filter		Structures designed to treat surface water runoff through filtration using a sand bed filter medium. The filters can be designed with or without infiltration. Temporary storage of runoff is achieved through ponding above the filter layer. They are used where particularly high pollutant removal is required.	Flexibility of design, efficient in removing pollutants, suitable for retrofits and in tightly constrained urban locations.	Not for high sediment content.	Yes, may be applied where reasonable.
	Sub-surface sand filter					
	Perimeter sand filter					
Filtration	Bioretention/filter swale		Vegetated strips of land designed to accept runoff as overland sheet flow between a hard-surfaced area and a receiving system.	Landscaping features, effective in removing pollutants, flexible layout to fit into landscape, suited for highly impervious areas, good retrofit capability, effective pre-treatment option	Requires landscaping and large land requirement, not suitable for steep sites, no significant attenuation or reduction of flows.	Yes, small scale may be applied where reasonable.
	Filter trench/drain		Shallow excavations filled with rubble or stone that create temporary subsurface storage for filtration of storm water runoff. Receive lateral inflow from an adjacent impermeable surface.	Hydraulic benefits achieved with filter trenches, trenches can be incorporated into site landscaping and fit well beside roads and car parks.	High clogging potential without effective pre-treatment, limited to small catchments, high cost of replacing filter material.	Yes, small scale may be applied where reasonable.

Detention	Detention basin		Surface storage basins that provide flow control through attenuation. Normally dry and in certain situations the land may also function as a recreational facility.	Cater for a wide range of rainfall events, can be used where groundwater is vulnerable, potential for dual land use, easy to maintain.	Significant land take, little reduction in runoff volume, detention depths constrained by levels.	Adequate land not available.
	Enhanced dry swale		Swales are linear vegetated drainage features in which surface water can be stored or conveyed. They can be designed to allow infiltration, where appropriate.	Incorporate into landscaping, good removal of pollutants, reduces runoff rates and volumes, low cost.	Not suitable for steep areas, significant land take, not suitable in areas with roadside parking.	Limited potential.
	Enhanced wet swale					
Conveyance	Conveyance swales		Formal linear drainage features in which surface water can be stored or conveyed. They can be incorporated with water features such as ponds or waterfalls where appropriate.	Negate the need for underground pipework. Can provide some attenuation. Possible reduction in runoff volume via plant uptake and infiltration.	Potential trip/wheel hazard. Children playing in. Limited treatment.	Yes, there is excellent potential for use at this site. Needs further consideration and detailing.
	Rills					
Source control	Green/Brown roof		Multi-layered system that covers the roof of a building with vegetation cover/landscaping over a drainage layer. Designed to intercept and retain precipitation, reducing the volume of runoff and attenuating peak flows.	Mimics greenfield state of building footprint for high density developments, good removal of pollutants, ecological benefits, insulates buildings, sound absorption.	Additional weight, not appropriate for steep roofs, maintenance of roof vegetation.	Yes, to be considered for viability at later stage, but given height of buildings unlikely to be appropriate.

	Permeable Paving or porous asphalt		Permeable block paved or porous asphalt system with permeable subbase	Mimics Greenfield state and provides vehicle surface	Slightly increased long term maintenance.	Yes, for all private parking and footpaths on site. Agreement would be needed for adopted roads from Hillingdon. We understand Hillingdon does not currently accept or adopt such options due to ongoing maintenance concerns.
	Rainwater harvesting		Uses rainwater coming from roofs to supply toilets, washing machines and irrigation systems. Harvested rainwater is stored underground and is substituted for potable water mains supply, reducing both site discharge and water consumption.	Can provide source control of storm water runoff, reduces demand on mains water.	Use is dependent on demand requirements, contributing surface area, and seasonal rainfall characteristics	No, expensive and limited need for water may restrict viability. To be considered further during design stage.

5 PROPOSED strategy

5.1 Foul Water

There is an existing public sewer across the site. The sewer is assumed to serve approximately 250 houses, with a potential design flow of 12 l/s.

Given the existing gradient, the maximum full bore flow is therefore approximately 26 l/s.

The foul sewer is therefore assumed to have sufficient capacity to take the developments foul flows without attenuation, or major works outside the site or adjacent roads.

Full consultation with the Sewerage Authority will be undertaken in due course.

It is assumed that most of the existing foul drainage will be made redundant and removed as part of the development.

We propose to disconnect any existing surface water connections from the foul sewerage system that may exist, where reasonably practical. This will reduce the risk of sewer surcharge for local residents from that existing.

Based on the basic mixed use commercial total (no wet industry assumed) existing flows are estimated to be 1.1 l/s. The proposed flows are estimated to exceed 1.3 l/s. The upper flow in relation to the new domestic accommodation is 6.1 l/s.

The replacement of existing foul drains with new sewers is likely to reduce groundwater infiltration to the sewer, reducing the risk of flooding.

It is assumed therefore that the development will not result in a net increase in flows to the foul sewer.

New connections to the existing public sewers in the public highway will be necessary.

The majority of the foul drainage on the Trout Road side drains through the old Onslow Mills site. As part of the redevelopment of this site the sewer was relocated and capacity increased to manhole 8502. There is potential that Thames Water will require a new enlarged drain to be laid under the Trout Road into the site but no other works are anticipated at this stage.

Two sections of existing foul sewer may require diversion. Early consultation will be held with Thames Water to secure permission, as necessary.

5.2 Surface Water

It may be possible to discharge part of the sites surface water flows to the 225mm or 450mm surface water sewers in St Stephen's Road. CCTV may show existing drainage rights to these sewers.

Traditional deep SUDS solutions such as concrete ring soakaways are not likely to be viable. Further site testing as set out previously will be undertaken to inform the detailed design.

Surface based, source control SUDS solutions, such as rills, landscaping water features and permeable blocked paved or porous asphalt car parking areas are proposed.

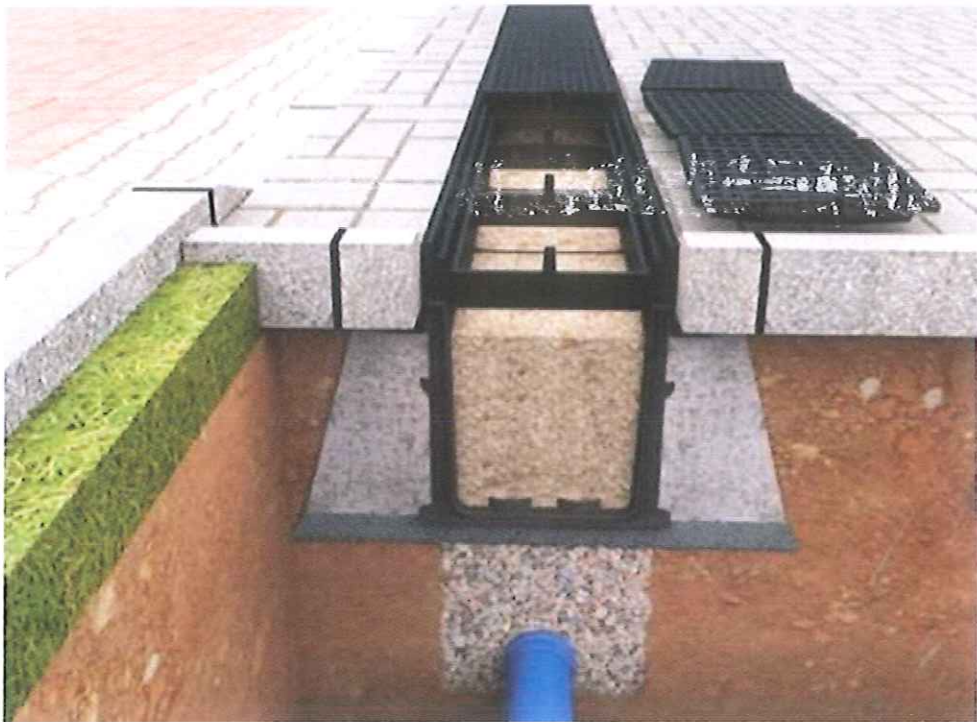
The development will result in a reduced extent of impermeable area. The effect will be that the peak discharge to offsite infrastructure will reduce from that existing, reducing flood risk elsewhere.

The new surface water infrastructure will be designed to modern standards, including greater attenuation and reduced risk of site flooding to that currently applicable.

The site particularly lends itself to the use of rills (see below photo). Such features are encouraged by the Government as re-introducing the public to water within the built environment.



In other locations shallow surface water treatment is recommended (see below photo).



It is likely that at least part of the site will require pumped flows. These pumped flows could be discharged either to the canal or surface water sewers in St Stephen's Road. New legal agreements – a Section 106 with Thames Water or/and new licence with British Waterways, will be obtained for either of these options.

We are not aware of any issues which would prevent a viable surface based solution to be detailed and constructed.

5.3 Electricity

An initial load estimate has been undertaken for the all new buildings/blocks within the proposed new site development using BSRIA Rules of Thumb and past experience on similar projects. Existing electrical demands have also been considered.

A summary of the preliminary electrical load estimate is shown below:

AA1832 TROUT ROAD- SUMMARY- TOTAL SITE ELECTRICAL LOAD ESTIMATE				
RESIDENTIAL BLOCKS- R1 to R7 + M1	Grand Total =	3,000.00	kVA	
BUSINESS UNITS- C1 to C3	Grand Total =	312.00	kVA	
RETAIL BLOCK- M1	Grand Total =	81.88	kVA	
	TOTAL SITE ELECTRICAL LOAD =	3,393.88	kVA	three phase and neutral
Notes: 1) Calculations are preliminary only and based upon Architects' preliminary accommodation schedule dated 08.12.2011 2) Calculations exclude electrical load from external services; but it is estimated that this will be accounted for within the individual building estimates and spare capacity allowance.				

As indicated within the table above, the total site electricity demand is deemed to be of the order of 3.4 MVA, three phase and neutral.

It is assumed that a new 3.5 minimum MVA sub-station will be required to meet the electricity requirements for the proposed new site development. From this point, supplies will need to be taken from the sub-station to feed individual buildings where the supply will terminate within a dedicated LV switchroom within each of the buildings via UKPN Service Termination Fuse Heads/Switches. This new station would need to be located in an accessible location to the existing or proposed public highway, but there is flexibility in location to suit the layout.

There is an existing sub-station next to the Trout Road just within the site boundary (adjacent to the new R6 block footprint which is assumed to be made redundant).

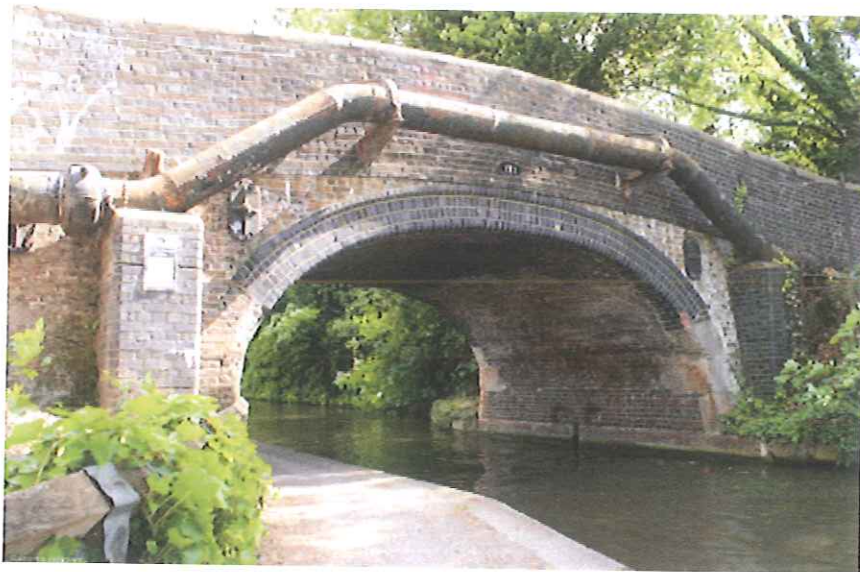
Further investigations and liaisons will be undertaken with UKPN during subsequent stages of design development, but adequate provision to the site is not considered insurmountable.

5.4 Gas

There are some existing gas mains within the site. These will be made redundant. New gas mains will be installed to suit the development layout.

Based on information currently available from the Utility Authorities and record drawings, it is considered that the gas mains along the site boundaries are likely to have sufficient capacity to meet the demand for the new development.

This is subject to further investigation and liaison with the relevant Authority during subsequent stages of design development.



The existing gas main in Trout Road is made visible where it crosses the British Waterways Bridge 191, just West of the site.

A number of small existing gas mains will need to be diverted, for example in relation to buildings C1 and C2, but this is not considered to be a problem.

5.5 Conclusions

Based on this preliminary evidence it is concluded that there are not any insurmountable obstructions to the servicing of the proposed development.

Particularly in relation to the surface water, it is anticipated that the proposals will result in a considerable net benefit, in flood reduction and ecological value. The proposals will result in an increase in discharge to groundwater assisting with groundwater recharge in London.

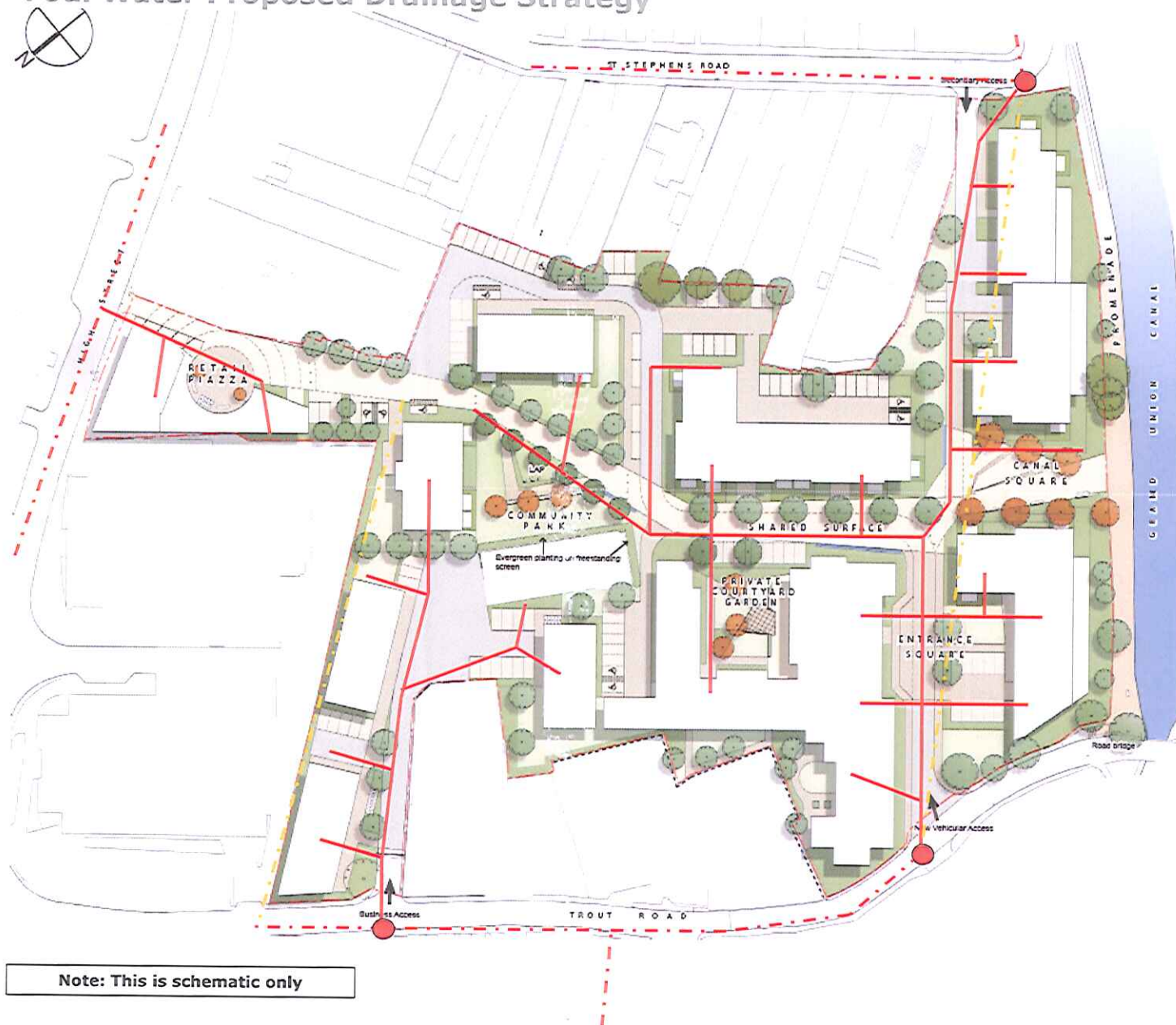
The proposal allows for a new substation and new buried pumping station (locations to be agreed) but no other major infrastructure elements is considered necessary at this stage.

We are not aware that any of the proposals would have a detrimental effect on ecological, trees, archaeology or other environmental elements.

APPENDICES

RAINBOW ESTATE, WEST DRAYTON

Foul Water Proposed Drainage Strategy



NOTES

- Existing Foul Water Drain
- Proposed Foul Water Drain
- New Foul Water Manhole On public highway
- - - Existing Foul (redundant/removed)

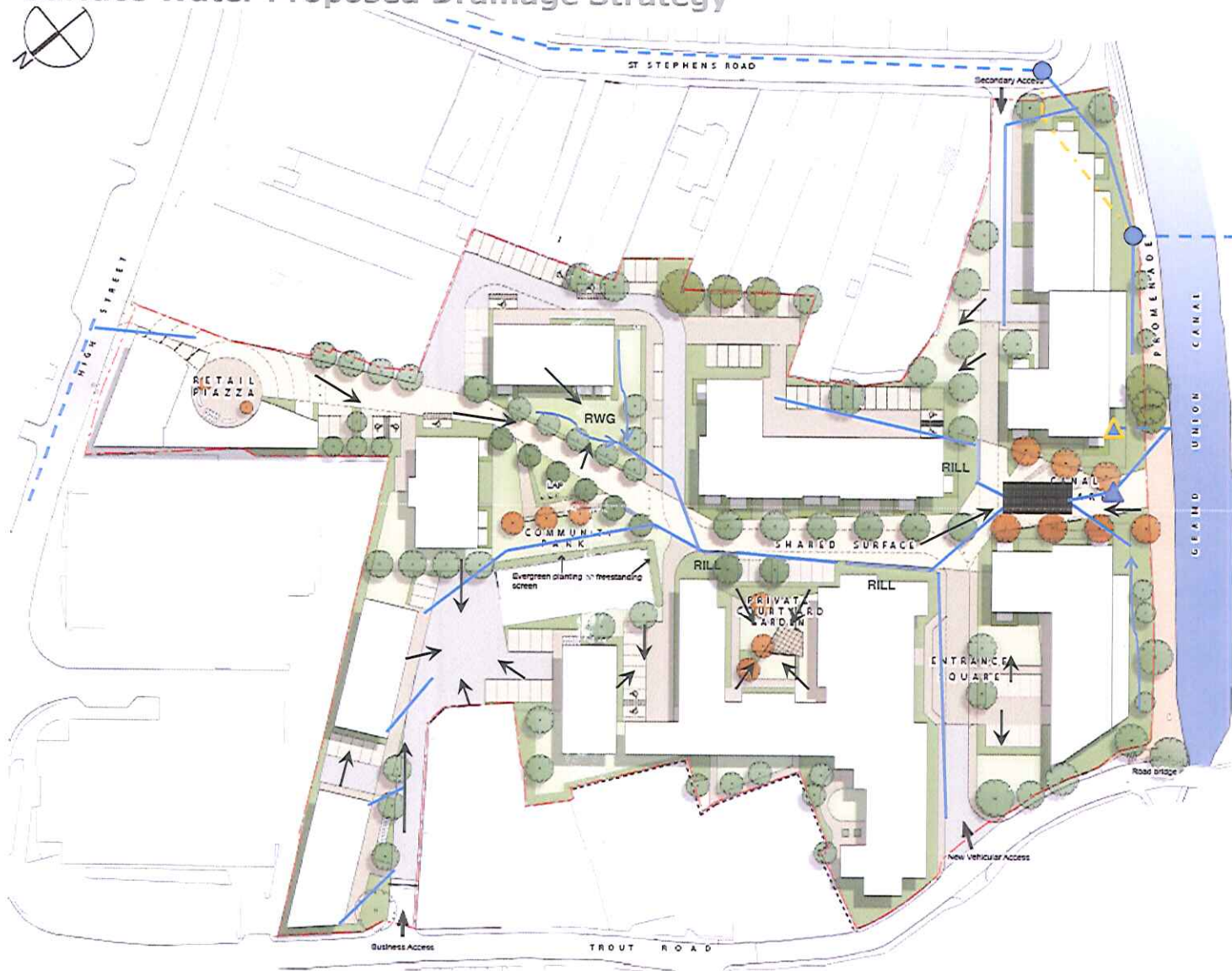
• To be read in conjunction with the Drainage Strategy.

RAMBOLL

Project Title		Rainbow Estate	
Project N°		19890	
Sketch N°		SK100	
Title		Foul Water Proposed Drainage Strategy	
Scale		NTS	
Eng:	Rev:	Date:	Checked
SDG	P01		-

RAINBOW ESTATE, WEST DRAYTON

Surface Water Proposed Drainage Strategy



NOTES

- - - Existing Surface Water Drain
- Proposed Surface Water Drain
- Surface Water Manhole
- Surface Water Swale
- 1:100 flood storage flow
- RWG - Rainwater Garden
- Rill
- Buried stormwater attenuation crates
- - - Existing surface (redundant/removed)
- ▲ Existing Surface water pumping station
- ▲ Proposed Surface water pumping station

- Flood flows shown for 1:100 events or worse and climate change impact
- All roads other than the first 8m from the existing public highway on Trout Road are permeable (either porous asphalt or permeable block paved. Or as otherwise agreed with the SAB / Hillingdon LB

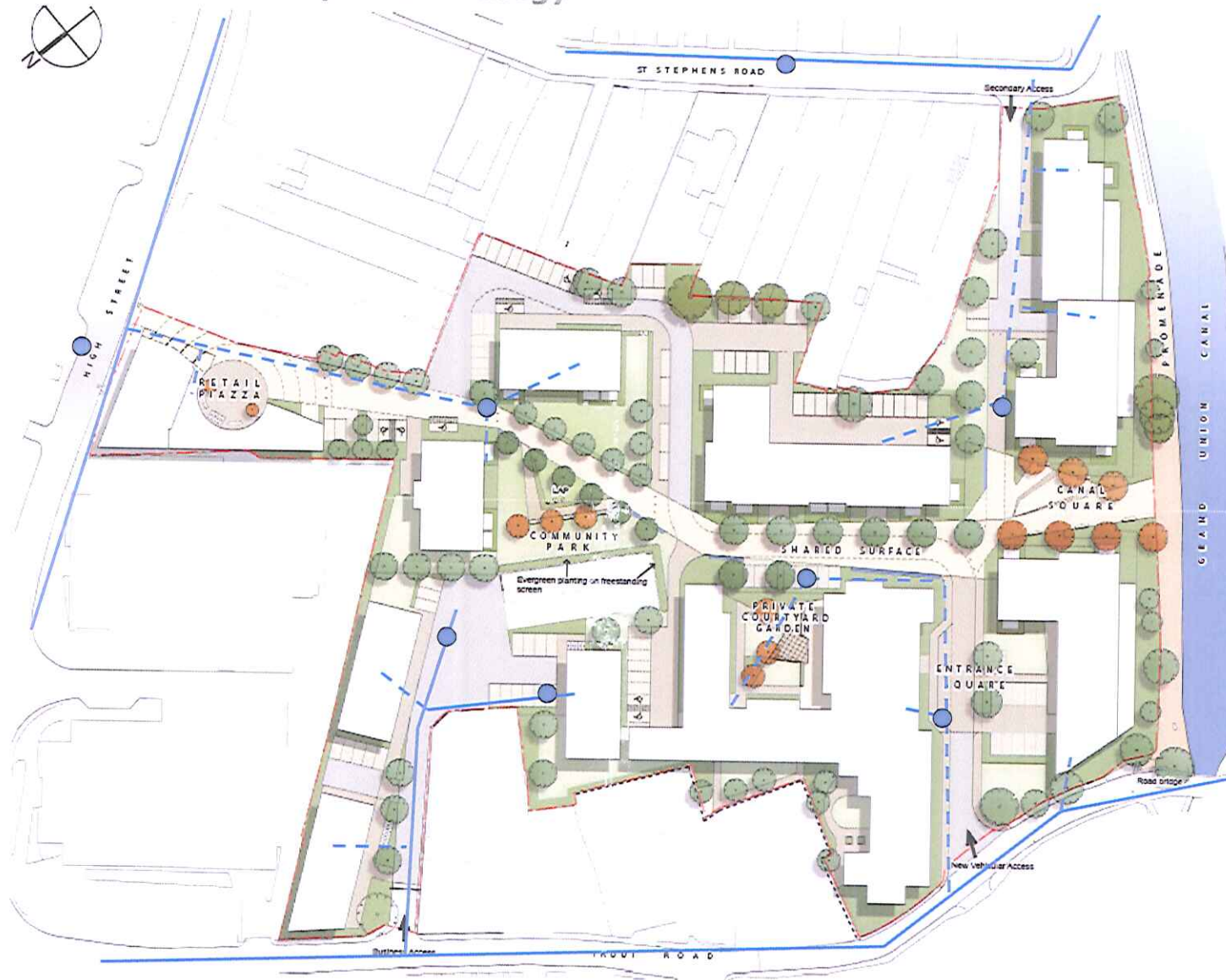
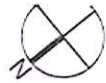
RAMBOLL

Note: This is schematic only

Project Title		Rainbow Estate	
Project N°		19890	
Sketch N°		SK101	
Title		Surface Water Proposed Drainage Strategy	
Scale		NTS	
Eng:	Rev:	Date:	Checked
SDG	P01		-

RAINBOW ESTATE, WEST DRAYTON

Mains Water Proposed Strategy



Note: This is schematic only

NOTES

- - - New clean
- Existing clean
- Hydrant

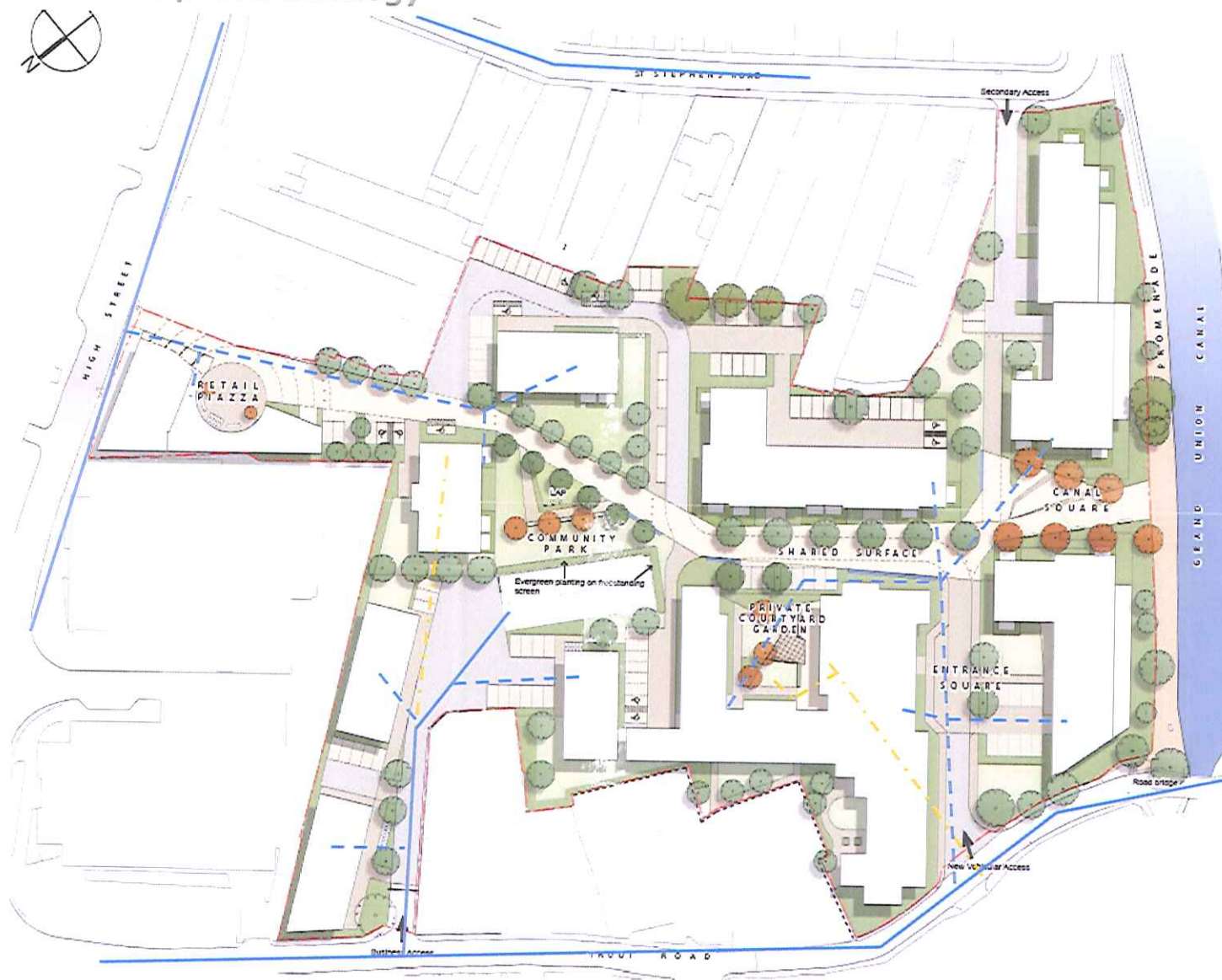
See Utility records for further detail.
Proposed route of new clean water not
agreed with Thames Water

RAMBOLL

Project Title		Rainbow Estate	
Project N°		19890	
Sketch N°		SK102	
Title		Mains Water Proposed Strategy	
Scale		NTS	
Eng:	Rev:	Date:	Checked
SDG	P01		-

RAINBOW ESTATE, WEST DRAYTON

Gas Proposed Strategy



Note: This is schematic only

NOTES

- New gas
- Existing gas
- Existing gas redundant

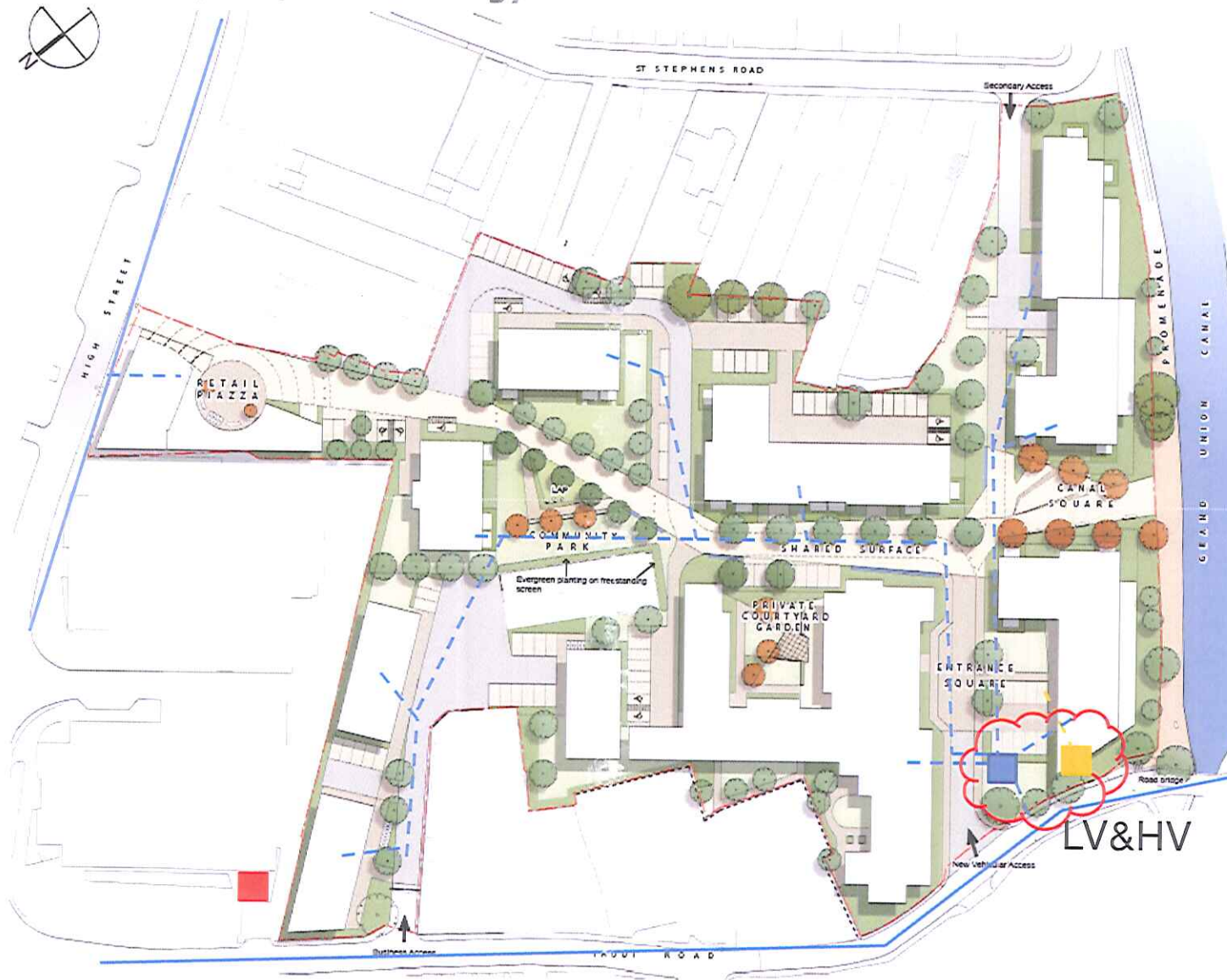
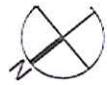
See Utility records for further detail.
Proposed route of new gas not agreed
with Gas Transporter

RAMBOLL

Project Title		Rainbow Estate	
Project N°		19890	
Sketch N°		SK103	
Title		Gas Proposed Strategy	
Scale		NTS	
Eng:	Rev:	Date:	Checked
SDG	P01		-

RAINBOW ESTATE, WEST DRAYTON

Electricity Proposed Strategy



Note: This is schematic only

NOTES

- New LV (electric) Route
- Existing LV (electric) Route
- New Substation
- Existing Redundant
- Existing substation retained
- ☁ Zone of extensive electrical reconfiguration assumed

See Utility records for further detail.
Proposed route of new LV/HV subject to further consultation and agreement with UKPN.

RAMBOLL

Project Title		Rainbow Estate	
Project N°		19890	
Sketch N°		SK104	
Title		Electric Proposed Strategy	
Scale		NTS	
Eng:	Rev:	Date:	Checked:
SDG	P01		-